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Interaction of a Coastal Front and Developing Cyclones

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1. Introduction

This research involved the application of analysis, diagnostic and modeling techniques in the study of the mesoscale and synoptic-scale meteorological processes that prevailed during the second intensive observation period (IOP 2) of the Genesis of Atlantic Lows Experiment (GALE). In this period from 24-28 January 1986, a variety of weather phenomena prevailed in the eastern United States. There existed cold-air damming in the Appalachians, coastal frontogenesis, intense cyclogenesis, mesobeta-scale vortices in the cold airmass, strong upper-level jet dynamics, and significant convective and stable precipitation. In this study, we focussed on the mesoscale coastal dynamics with an emphasis on a coastal low-level jet, the coastal front, and the interaction between the coastal front and the cyclones that developed and moved near the coastline. Our approach involved performing detailed mesoanalyses and diagnostic calculations to define initial conceptual models of relevant processes, and then to verify and refine these ideas using numerical model experiments.

2. Publication resulting from the research

The following lists describe the journal publications, the technical-conference papers, and the theses that acknowledge the support of this grant. Copies of the journal publications are attached.

a.) Journal publications

Doyle, J.D. and T.T. Warner, 1991: A Carolina coastal low-level jet during GALE IOP 2. Accepted for *Mon. Wea. Rev.* (to appear in October 1991.

Doyle, J.D. and T.T. Warner, 1990: Mesoscale coastal processes during GALE IOP 2. *Mon. Wea. Rev.* **118**, 283-308.

Doyle, J.D. and T.T. Warner: The impact of the sea-surface temperature distribution on cyclogenesis during GALE IOP 2. *Wea. Rev.* (In preparation).

Doyle, J.D. and T.T. Warner: A numerical investigation of Carolina coastal frontogenesis during GALE IOP 2. *Mon. Wea. Rev.* (In preparation).

Doyle, J.D. and T.T. Warner: A three-dimensional numerical investigation of a coastal low-level jet during GALE IOP 2. *Mon. Wea. Rev.* (In preparation).

Doyle, J.D. and T.T. Warner: A numerical investigation of mesoscale interaction between a coastal front and a small-scale cyclone during GALE IOP 2. *Mon. Wea. Rev.* (In preparation).

b). Technical conference presentations

Doyle, J.D. and T.T. Warner, 1987: Preliminary surface analysis of the evolution of the coastal front during GALE IOP 2. Paper presented at the Sixth Extratropical Cyclones Workshop, Pacific Grove, California, 16-20 February 1987.

Doyle, J.D. and T.T. Warner, 1987: Transitions in the marine boundary layer and coastal front during GALE IOP 2. Paper presented at the GALE/CASP Workshop, Virginia Beach, Virginia, November 2-6, 1987.

Warner, T.T., J.D. Doyle and N.L. Seaman, 1987: A modeling study of the thermally driven circulation produced by the sea-surface temperature gradients during GALE IOP 2. Paper presented at the GALE/CASP Workshop, Virginia Beach, Virginia, November 2-6, 1988.

Doyle, J.D. and T.T. Warner 1988: An analysis of the coastal front and low-level jet during GALE IOP 2. Presented at the GALE/CASP Workshop, Val Morin, Quebec, Canada, October 2-7, 1988.

c) Theses

Doyle, J.D., 1991: An observational and numerical investigation of mesoscale coastal processes during GALE IOP 2. Ph.D. thesis, Dept. of Meteor., The Pennsylvania State Univer., 253 pp. [Available from Dept. of Meteorology, Penn State University, University Park, PA 16802]